

Amendments to the Drawings:

An amended Figure 7 is submitted herewith (in Exhibit C) with the numeral "50" shown in red. Replacement Sheets are being provided for all the Figures, in addition to Figure 7. The Replacement Sheets simply include formal versions of the prior submitted drawings, and include the amendment to Figure 7 above.

REMARKS

General:

Claims 1-19 were pending in this application. Claims 7-12 stand withdrawn from consideration, and are now canceled. Claims 1-6 and 13-19 stand rejected. Claims 20-31 are new. New claims 20-31 correspond to claims 1-6 and 13-18 as they stood before the amendment filed on 1 May 2004, and are included to put the application in better order for appeal, by presenting claims that are not subject to the Examiner's § 112(1) rejection. No new matter has been added by this amendment. Claims 1-6 and 13-31 are pending after this amendment.

Comment:

Applicant and his attorney regret that there appears to be disagreement as to the language that was decided during the interview would move this case forward to allowance. It appears probable that a stalemate has been reached. Applicant continues to believe that the rejections of the claims are improper in both fact and law. As such, the Examiner will note that the amendments and submissions in the present response are to some extent directed to putting the application in condition for appeal.

Drawings:

A replacement sheet of drawings containing an amended Figure 7 is filed herewith. The amendment consists of adding the reference character "50" that identifies the anti-kickback at page 10, line 23. The Replacement Sheets also include formal versions of the prior submitted drawings.

Claim rejections – 35 U.S.C. § 112:

Claims 1-6 and 13-19 are rejected on the ground that the recitation of reduced residual tensile stress, or residual compressive stress, is new matter. Applicant respectfully submits that the §112 rejection is improper.

As a starting point, the Examiner's attention is drawn to the law as it pertains to a new matter rejection.

"By disclosing in a patent application a device that inherently performs a function or has a property, operates according to a theory or has an advantage, a patent application necessarily

discloses that function, theory or advantage, even though it says nothing explicit concerning it. The application may later be amended to recite the function, theory or advantage without introducing prohibited new matter.” MPEP § 2163.07(a), citing to *In re Reynolds*, 443 F.2d 384, 170 USPQ 94 (CCPA 1971) and *In re Smythe*, 480 F. 2d 1376, 178 USPQ 279 (CCPA 1973).

The present application, as originally filed, disclosed a process, and a product produced by that process, comprising finishing a saw blade with abrasive media in a high speed centrifugal finishing apparatus. That process as originally disclosed “produces a universal stressing of the surface of the material,” Page 10, line 8, and reduces embrittlement of the blade, see page 10, lines 4 and 20. It is well understood that a reduction in embrittlement is a reduction in the residual tensile stress in the part. Residual tensile stress in a part essentially acts to tear apart the molecules within a part (i.e., resulting in a brittle part - embrittlement).¹ Thus, the specification as filed clearly and unequivocally discusses reducing the embrittlement, i.e., reducing the residual tensile stresses, in a part through the application of the claimed process steps to the part as it is being made. (Logically, the decrease of a residual compression stress results in an increase in the residual compression stress in a part. Basic stress theory holds that a negative tensile stress is a positive compressive stress.)

Accordingly, based on the foregoing, it is respectfully submitted that the Examiner’s rejection of claims 1-6 and 13-19 under 35 U.S.C. §112 is improper. Reconsideration and withdrawal of the rejection of these claims is requested.

In order to provide further evidence that a saw blade produced by the process as recited in the claims is structurally different than an unprocessed saw blade, Applicant submitted X-ray diffraction residual stress measurement results from American Stress Technologies, Inc. (AST) (Exhibit C to the response filed on May 1, 2004). Those results confirm that a saw blade made in accordance with the claimed invention has reduced residual tensile stress (increased compressive stress) as compared to a conventional saw blade. As further confirmation of this, Exhibit A to the present response includes reports from TEC Materials Testing Laboratory of comparative measurements of residual stress as a function of depth for components (not saw blades) treated by Applicant’s process and components not so treated, together with a copy of the A2LA accreditation certificate for TEC to perform this test. TEC’s test is different from the

¹ The term “residual” is well known as referring to the state of the stresses in an unloaded part.

testing conducted by AST since TEC's testing involves removing material from the surface (ironically, by electropolishing - a process chosen because it does not itself change the residual stress in the workpiece, it simply removes layers of material.) It is proper to use extrinsic evidence to "make clear that the missing descriptive matter is necessarily present in the thing described." *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). The TEC and AST test results are such extrinsic evidence and both establish that application of the process claimed to a product will result in reduced tensile stress in the product. In the saw blade used for the X-ray diffraction test, the reduction in tensile stress was sufficiently great to produce a net compressive stress in the part.

It is therefore submitted that the amendments to claims 1, 13 and 19 were proper and did not introduce new matter. Reconsideration and withdrawal of the §112 rejection is requested.

Claim rejections – 35 U.S.C. § 102:

Claims 1, 2, 6, 13, 14, and 18 are rejected as anticipated by U.S. Patent No. 5,802,932 (Vankov). The Examiner argues that Vankov inherently teaches reduced residual tensile stress because the "smoother cutting edge or sharper cutting edge minimizes the contact surface of the cutting edge with the workpiece and consequently reduces the residual tensile stress."

It is respectfully submitted that the Examiner's argument is erroneous. Even ignoring the implausibility of the proposition that *minimizing* the contact surface will *reduce* stress (stress is defined as force per unit area and, thus, usually increases when an applied force is distributed over a smaller area), the force that arises from contact between the cutting edge and a workpiece is the *applied load* stress, and not the *residual* stress. Residual stress is usually defined as the stress which remains in mechanical parts which are not subjected to any outside stresses. Excerpts from various works of reference, showing that this distinction has been consistently understood for at least the last 50 years, are attached as Exhibit B to this response. Thus, the Examiner's argument in support of the §102 rejection is technically incorrect. The Examiner has made no showing that the sharpening of the edge of Vankov's blade will affect the *residual* stress in the material.

In fact, Vankov forms and sharpens his blade by etching and electropolishing, which will not affect the residual stress, and clearly teaches only the desirability of etching and electropolishing. The examiner's attention is drawn once again to the certificate of accreditation

in Exhibit A. This document states that TEC Materials Testing Laboratory uses “Electropolishing for Subsurface Analysis of Residual Stress.” As shown by the report, electropolishing is used to remove layers of material in order to determine how deep into the part the residual stress extends. Hence, electropolishing is used exactly because it does not alter the residual stress in a part. Logically, a process that did alter the residual surface stress would obliterate the very thing that is being measured, and would, therefore, be useless. There is no suggestion in Vankov of using a different process instead of etching and electropolishing.

Based on the foregoing, it is respectfully submitted that the present invention, as recited in claims 1, 2, 6, 13, 14, and 18, is not only new but also non-obvious over Vankov. Reconsideration and withdrawal of the §102 rejection of these claims is solicited.

Claim rejections – 35 U.S.C. § 103:

Claims 3-5, 15-17, and 19 were rejected as being unpatentable over Vankov alone or in combination with U.S. Patent No. 5,555,788 (Gakhar et al.) However, these rejections all seem to be predicated on the Examiner’s argument that Vankov discloses reducing the residual tensile stress. Without prejudice to their individual merits, therefore, these claims are believed to be both novel and non-obvious over Vankov and/or Gakhar for the same reasons described above regarding claims 1 and 13.

Claims 1, 2, 6, 13, 14, and 18 are further rejected as being obvious over Vankov in view of U.S. Patent No. 6,220,375 (Butcher). In asserting this rejection, the Examiner contends that Vankov shows all of the features of claim 1 except for a surface with a reduced residual tensile stress. The Examiner asserts that “the use of a cutting blade with a reduced residual tensile stress is well known in the art such as taught by Butcher.” Applicant disagrees.

Vankov describes a cutting blade for an electric beard trimmer. Butcher describes a cutter (not a cutting blade) for use in *earth boring bits* that has a polycrystalline diamond (PCD) table on a carbide substrate. Accordingly, as a starting point, Butcher is directed to a completely different product that has nothing to do with saw blades or cutting blades. Thus, it is submitted that Butcher is non-analogous art. There is no suggestion in either Vankov or any of the other art of record for someone to look in the field of earth boring tools to solve a problem in the field of saw blades. The mere fact that the only reference found by the Examiner that suggests any

consideration of residual stress happens to be in the earth boring field highlights the basic lack of appreciation in the saw blade field for the affect that residual stress has on a blade.

Assuming for the sake of argument that someone in the field of saw blades would have been motivated to look to the field of earth boring equipment, the Examiner's assertion that the Butcher reference establishes that reducing residual stress is well known, is still incorrect. Butcher explains that PCD "cutters, by virtue of the materials comprising the PCD table and the support, inherently have residual stresses existing in the compact therebetween, throughout the table and the carbide substrate, and particularly at the interface." Col. 1, lines 28-32. Butcher is concerned entirely with controlling the tensile stress in one layer and the compressive stress in the other layer of a compact of PCD and carbide to avoid delamination at the interface between the PCD and carbide layers. There is nothing in Butcher that would have suggested to a person of ordinary skill in the art even to consider the question of residual stresses in a metal cutting blade such as Vankov's.

The Examiner asserts that it would have been obvious "to provide [Vankov's] blade portion with the process as taught by Butcher in order to obtain a desired residual tensile and a compressive residual stress." Applicant respectfully disagrees. It would not have been obvious, because it would have been impossible to do so. Butcher's process is concerned entirely with a compact of two different materials, with a tensile stress in one layer and a compressive stress in the other layer. Vankov's blade does not have two layers, so *cannot* have such a stress pattern. (The layers 41, 42 shown in Fig. 6 and the layer 78 shown in Fig. 7 are not additional layers of the blade, but temporary masks used during the etching and electropolishing process. See col. 10, lines 33-34 and 46-47.)

Accordingly, the Examiner's reliance on Butcher fails to remedy the basic deficiencies associated with Vankov. Thus, the combination of Butcher and Vankov does not render the claims unpatentable. Reconsideration and withdrawal of the §103 rejections of claims 1-6 and 13-19 is respectfully requested.

New claims 20-31:

The previous versions of claims 1 and 13 are being represented as new claims 20 and 26. These claims were rejected as anticipated by Vankov. The Examiner previously refused to give weight to the process steps in original claims 1 and 13, apparently (though this is never explicitly

stated) because he did not believe that the process steps resulted in a distinct product. The Declaration of Jeffrey Coats, previously filed, and the other exhibits to the Applicant's response filed on 1 May 2004, show that the process steps recited in then pending claims 1 and 13 (now claims 20 and 26) do produce a different product, by reducing residual tensile strength in the surface layer. Additional evidence, in the form of quantitative measurements of residual stress by an independent testing laboratory, are filed as Exhibit A to this response. The Examiner now argues that Vankov's product will also inherently have reduced residual stress. However, as explained above with reference to claim 1, Vankov's product will *not* have reduced residual stress, because Vankov deliberately chooses, for unrelated reasons, two forming processes that do not affect the residual stress in the material. Because the Applicant's process produces a product with reduced residual stress, and Vankov's product does not have reduced residual stress, the process steps do provide a structural difference in the resulting product and, as has been shown above with reference to claim 1, that difference is non-obvious over Vankov. Claims 20 and 26 are therefore entitled to be given full weight for that structural difference, and are believed to be novel and non-obvious.

Claims 21-25 and 27-31 are dependent from claims 20 and 26 and, without prejudice to their individual merits, are believed to be allowable for the same reasons as claims 20 and 26.

As discussed above, claims 20-31 are being re-presented because the Examiner appears to be against according the process limitations patentable weight and incorrectly suggests that new matter was introduced in the pending claims 1-19. Applicant is entitled to have these new claims fully considered on appeal in the event the Examiner's rejection of claims 1-19 is upheld.

Conclusion:

In view of the foregoing, it is respectfully submitted that the present invention is not only new but also non-obvious over the cited prior art. Reconsideration and withdrawal of the Examiner's rejections and an early notice of allowance of all claims is earnestly solicited.

Respectfully submitted,
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AMENDED FIGURE

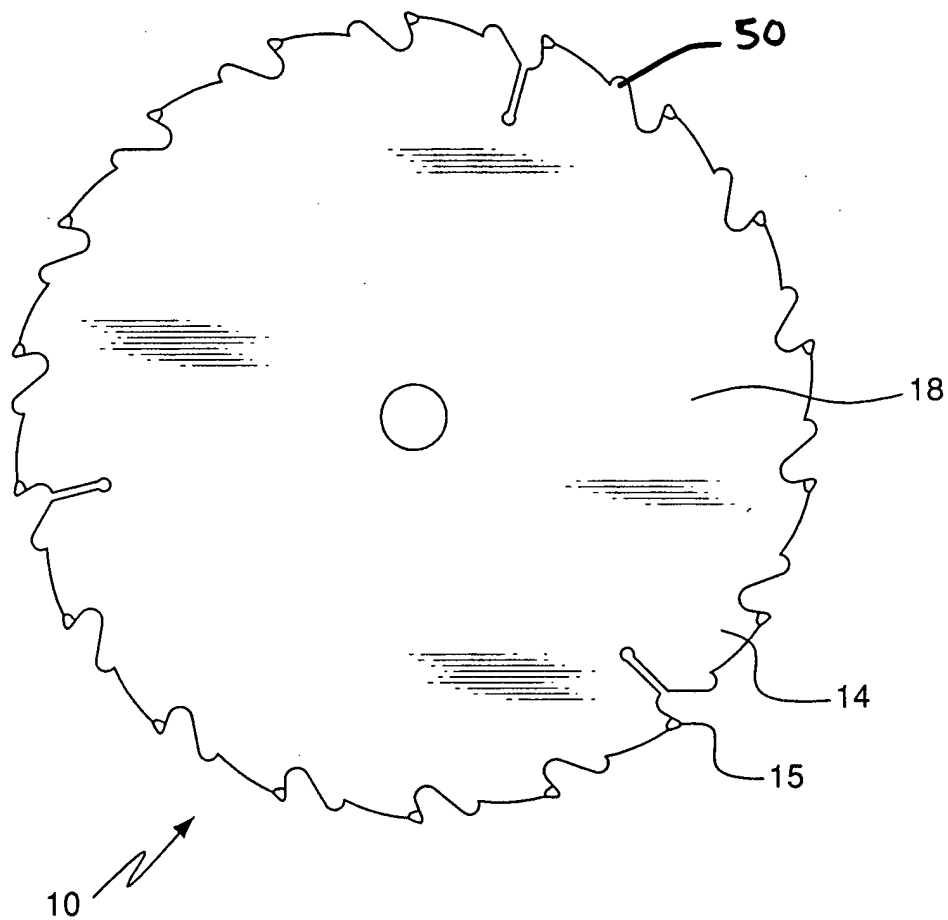


FIG. 7